

What is claimed

1. A continuous digester system comprising:

- a. a pressure vessel having a lengthwise axis, a rear upstream inlet end having a wood chip intake means, and a front outlet end having a pulp outlet means, said vessel having an elongate processing chamber through which wood chips travel forwardly in the presence of a digesting agent while being transformed into pulp, with the pulp being discharged from the pulp outlet means at the front outlet end of the vessel;
- b. liquid flow means to circulate processing liquid through said digester to carry dissolved solids with said processing liquid, said flow means comprising:
 - i. initial inlet means to initially introduce processing liquid into the pressure vessel at an initial inlet downstream location;
 - ii. a plurality of processing liquid inlet means at inlet locations along the lengthwise axis of the pressure vessel to introduce processing liquid into the processing chamber;

iii. a plurality of processing liquid outlet means at outlet locations along the lengthwise axis of the pressure vessel to extract processing liquid from said processing chamber, said outlet locations being spaced laterally from said inlet locations, so that flow of said processing liquid from each of said inlet means to related outlet means has a lateral flow component through said processing chamber;

iv. recirculating means comprising a plurality of interconnecting line means, at least some of said interconnecting line means connecting at least some of the outlet means with related inlet means at further upstream locations to direct processing liquid from said at least some of said liquid outlet means through related interconnecting line means to further upstream locations to flow through the related liquid inlet means into the processing chamber and

laterally in the processing chamber to other outlet means to again be recirculated through related

5 interconnecting line means to
other inlet means;

v. liquor outlet means to discharge liquor, said liquor outlet means being upstream of the initial downstream location and upstream of at least some of said liquid inlet means and said liquid outlet means;

15 c. said digester system being characterized in that the processing liquid moving in a recirculating pattern through the processing chamber and through said

20 recirculating means carries dry
solid content extracted from the
wood chips during processing in the
processing chamber in a net upstream
flow pattern to be discharged from
25 the processing chamber at said
liquor outlet means.

2. The system as recited in claim 1, wherein
there is a washer to receive pulp from the
digester and to dewater and wash the pulp, a
substantial portion of filtrate from the washer
being directed into the initial inlet means as
said processing liquid to move through said

recirculating means in said net upstream direction.

3. The system as recited in claim 2, wherein
a digesting agent is introduced into said liquid
5 flow means to flow through said recirculating
means and through said processing in a net
upstream direction to extract dry solids content
from said wood chips being processed and carry
said dry solids content in a net upstream
10 direction.

4. The system as recited in claim 3, said
system further comprising an evaporation and
recovery means to receive liquor discharged from
said pressure vessel at a plurality of discharge
15 locations at different operating locations in said
pressure vessel so as to extract liquor having
different characteristics from different
extraction locations.

5. The system as recited in claim 4, wherein
20 said digesting agent is alcohol, with said
evaporation and recovery means extracting said
alcohol from said black liquor and recirculating
said recovery alcohol back to said liquid flow
means to be recirculated into said liquid flow
25 means.

6. The system as recited in claim 1, wherein
said system comprises an impregnation zone located
in said pressure vessel at an upstream location,
at least one cooking zone located downstream of
30 said impregnation zone, and at least one ~~wash~~
displacement zone located downstream of said
cooking zone, at least some of said liquid inlet
means and said liquid outlet means being located

at said displacement wash zone to receive said processing liquid and recirculate said processing liquid sequentially through related pairs of said liquid inlet means and said liquid outlet means,

5 said flow means further comprising means to move the processing liquid from the wash displacement zone to an upstream location to be directed into said cooking zone, to flow in a downstream direction in the processing chamber toward said
10 displacement wash zone.

7. The system as recited in claim 6, wherein at least some processing liquid from said displacement wash zone is recirculated ultimately to said impregnation zone to flow downstream in
15 said vessel through said impregnation zone and into said cooking zone.

8. The system as recited in claim 7, wherein liquor is extracted from the impregnation zone and directed to said evaporation and recovery means
20 for processing.

9. The system as recited in claim 8, wherein liquor is extracted from said cooking zone and directed to said evaporation and recovery means for processing.

25 10. The system as recited in claim 1, wherein said liquid flow means comprises at least one displacement wash zone, having a downstream end and an upstream end, with a plurality of said liquid inlet means being positioned at
30 longitudinally spaced inlet locations along a length of said displacement wash zone and a plurality of said liquid outlet means positioned at spaced locations along a length of said

displacement wash zone, said pluralities of liquid outlet and liquid inlet means being arranged so that there are a related first downstream and a second upstream liquid inlet means being arranged 5 to a related first downstream and second upstream outlet means in a manner that at least a portion of processing liquid from said first downstream inlet means flows through said processing chamber to pass into said first downstream outlet means, 10 with at least a portion of flow into said first downstream inlet means being recirculating through said recirculating means to said second upstream inlet means, with at least a portion of the flow from said second liquid inlet means flowing across 15 said processing chamber to said second upstream inlet means, with at least a portion of the flow from said second upstream inlet means being recirculated by said recirculating means in an upstream direction, thus accomplishing said net 20 upstream flow of processing liquid.

11. The system as recited in claim 1, wherein said pressure vessel has a generally cylindrical cross sectional configuration transverse to its lengthwise axis, and said 25 digester system comprises an inner-containing means positioned within said pressure vessel, with said inner-containing means defining the elongate processing chamber, said inner-container means comprises at least in part planar wall surfaces.

30 12. The system as recited in claim 11, wherein there are inlet screen means and outlet screen means located at longitudinally spaced locations at said planar wall surfaces, at least

some of said liquid inlet means passing liquid into said processing chambers through related screen means, and at least some of said liquid outlet means discharging processing liquid through related screen means, at least some of said screen means having propeller blade means which move across related screen means to prevent obstruction of flow through said screen means.

13. The system as recited in claim 1, wherein said pressure vessel comprises a generally cylindrical sidewall, which defines the processing chamber as a generally cylindrical processing chamber, at least one of said liquid inlet means and liquid outlet means comprises liquid passageway means formed in said cylindrical sidewall, said liquid passageway means having flow axes, said flow axes being slanted in a radially inward and forward direction.

14. The system as recited in claim 13, wherein said liquid flow means comprises a plurality of circumferential ring assemblies positioned at longitudinally spaced locations along said sidewall, each of said ring assemblies defining a flow chamber to communicate with related passageway means extending through said wall member.

15. The system as recited in claim 1, wherein said plurality of liquid inlet means and said plurality of liquid outlet means are arranged in alignment pairs, having an alignment flow path between the liquid inlet means and the liquid outlet means of a related pair, at least some of said pairs of liquid inlet and liquid outlet means

being arranged in an alternating pattern, whereby cross flow of processing liquid between adjacent alternating pairs have different flow directions through said processing chamber.

5 16. The system as recited in claim 1, wherein said elongate processing chamber is defined by a longitudinally extending chamber wall means, said liquid inlet means and said liquid outlet means being positioned at said chamber wall means in a manner that said liquid inlet means causes processing liquid to flow through said chamber wall means into said processing chamber, and said liquid outlet means extracts processing liquid from said processing chamber through said chamber wall means, said liquid inlet means and said liquid outlet means being arranged in related alignment pairs where at least some of the liquid from the liquid inlet means flows in a flow path substantially across said processing chamber to 10 its related liquid outlet means.

15 17. The method as recited in claim 1, wherein there is an evaporation and recovery means to receive liquor discharged from said pressure vessel, said evaporation and recovery means comprising at least first and second heat exchange means to cause evaporation of liquid from said liquor, and first and second separator means, said first evaporator means being arranged to initially receive liquor from said pressure vessel and to 20 discharge liquor from said first heat exchange means, means to direct liquor from said first heat exchange means to said first separator means said first separator means to separate a portion of the

liquor from to the first evaporator means, means to direct remaining liquor from said first separator means to said second heat exchange means where said remaining liquor is subjected to a further heat exchange process, means to direct liquor from said second evaporator means to said second separator means to extract a portion of the liquor from said second heat exchanger means.

18. The system as recited in claim 1,
10 wherein there are:

- a. at least one impregnation zone at an upstream location in said pressure vessel;
- b. first and second cooking zones, with said first cooking zone being positioned downstream of said impregnation zone, and said second cooking zone being located downstream of said first cooking zone;
- c. first and second displacement wash zones, with said first displacement wash zone being positioned downstream of said second cooking zone, and said second displacement wash zone being positioned between said first and second cooking zones;
- d. each of said displacement wash zones having a downstream end and an upstream end, with a plurality of said liquid inlet means being positioned at longitudinally spaced inlet locations along a length of

- e. said recirculating means interconnecting said first and second wash zones with said first and second cooking zones and said impregnation zone in a manner that within said processing chamber, there is a substantially continuous flow of pulp and processing liquid in a downstream direction from the inlet end to the outlet end, and a substantially continuous flow of processing liquid from said displacement wash zones through said recirculating means to upstream locations into said first and second cooking zones and into said impregnation zone.

whereby dissolved solids are carried through said recirculating means in a net upstream direction, while wood chips being processed into pulp and the processing liquid in the digester travel in downstream direction.

19. The system as recited in claim 1,
wherein said pressure vessel is aligned so that
25 its major alignment component is horizontal.

20. A method of digesting wood chips, said method comprising:

30 a. providing a pressure vessel having a lengthwise axis, a rear upstream inlet end having a wood chip intake means, and a front outlet end having a pulp outlet means, said vessel

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5 having an elongate processing chamber;

10 b. feeding wood chips through said wood chip intake means into said processing chamber and causing said wood chips to travel forwardly in said processing chamber in the presence of a digesting agent while being transformed into pulp, and discharging the pulp from the pulp outlet means at the front outlet end of the vessel;

15 c. circulating processing liquid through said digester to carry dissolved solids with said processing liquid by:

20 i. initially introducing processing liquid into the pressure vessel at an initial inlet downstream location;

25 ii. directing processing liquid through a plurality of processing liquid inlet means at inlet locations along the lengthwise axis of the pressure vessel into the processing chamber;

30 iii. directing processing liquid from said processing chamber through a plurality of processing liquid outlet means at outlet locations along the lengthwise axis of

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the pressure vessel to extract processing liquid from said processing chamber, with said outlet locations being spaced laterally from said inlet locations, so that flow of said processing liquid from each of said inlet means to related outlet means has a lateral flow component through said processing chamber;

iv. recirculating said processing liquid through a plurality of interconnecting line means, with at least some of said interconnecting line means connecting at least some of the outlet means with related inlet means at further upstream locations, by directing processing liquid from said at least some of said liquid outlet means through related interconnecting line means to further upstream locations to flow through the related liquid inlet means into the processing chamber and laterally in the processing chamber to other outlet means to again be recirculated

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through related
interconnecting line means to
other inlet means;

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